

25. (New) A process according to claim 14 in which a rinse step is used in the process after said acid cleaning step and prior to said displacement plating composition step.

REMARKS

Claims 1-18 are presently pending in the present application.

Claims 1-18 have been rejected.

Claims 1, 2, 4-6, 8, 10, 12, 14-15, and 18 have been amended.

New claims 19-25 have been added.

No new matter has been presented hereby.

Support for new claims 19-25 can be found in the application on pages 10-28.

For the convenience of the Examiner, the applicant's remarks herein have been set forth under appropriate sub-headings.

I. REJECTIONS UNDER 35 U.S.C. §112, SECOND PARAGRAPH

A. Claims 2, 4-6, 12, 14 and 15 stand rejected under 35 U.S.C. §112, second paragraph.

The Action recites that the phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. Applicant notes that "such as" is not in any of the claims. However, Applicant believes Examiner is referring to the term "preferably". As described hereinbelow, Applicant has amended claims 2, 4-6, 12, 14 and 15, and submits new claims in which the term "preferably" has been deleted. In light of the above, Applicant respectfully requests that the rejection to claims 2, 4-6, 12, 14 and 15 under 35 U.S.C. §112, second paragraph be withdrawn.

B. Claims 12 and 14 stand rejected under 35 U.S.C. §112, second paragraph. The Action recites that the limitation “the immersion coating composition” has insufficient antecedent basis for this limitation in the claims. Applicant has canceled the above phrase and has amended the claims to provide proper antecedent basis by reciting “aqueous displacement plating composition”. Applicant thus respectfully requests that this rejection be withdrawn.

C. Claims 2, 8, 10 and 18 stand rejected under 35 U.S.C. §112, second paragraph. The Action recites that the phrase “and/or” renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. In addition, the phrase is unclear whether all the components listed are included or only one of the components is included, i.e. a Markush claim. Accordingly, Applicant has amended claims to eliminate “and/or”. Therefore, Applicant respectfully requests that this rejection be withdrawn.

D. Claim 10 stands rejected under the 35 U.S.C. §112, second paragraph. The Action recites that the term “capable” is indefinite, as it is unclear what would not be considered as “capable”. Accordingly, Applicant has amended claims to eliminate the term “capable” therefrom. Therefore, Applicant respectfully requests that this rejection be withdrawn.

II. REJECTIONS UNDER 35 U.S.C. §103(a)

A. Claims 1, 3-9 and 11-17 stand rejected under 35 U.S.C. §103(a) as obvious over Greenberg et al. (USPN 3,993,845, hereafter referred to as “Greenberg”) in view of Donley et al

(4,171,393, hereafter referred to as "Donley"). Applicant respectfully traverses this rejection for the reasons set forth below.

The present invention teaches a process improvement in printed circuit board manufacture. As amended, claim 1 recites a process for providing a protective coating on metal conducting surfaces formed on a bare board in the manufacture of printed circuit boards, comprising the steps of contacting the metal surface elements with an aqueous displacement plating composition which comprises silver ions and a multidentate complexing agent in solution in an aqueous vehicle at a pH of from 2 to 12 to form a silver coating on the metal surface elements. Greenberg teaches a method of preparing a metallic copper-silver film on a non-metallic transparent substrate. The method of Greenberg teaches that the metallic copper-silver film is applied to transparent articles, specifically large sheets or plates of flat glass. Unlike the present invention, glass is not a printed circuit board and the Examiner has not shown any teaching or suggestion in the prior art to utilize the teachings in Greenberg on printed circuit boards.

Additionally, the method of Greenberg requires first sensitizing the surface of the substrate and then applying a copper film to the sensitized surface prior to contacting the copper film with a solution containing an ammoniacal silver salt and complexing agent. Greenberg recites that copper exposed on the substrate is likely to oxidize. Greenberg also teaches that the step of applying the copper film is accomplished by an electroless deposition.

As stated previously, the present invention is directed to a process improvement in printed circuit board manufacture. As recited in amended claim 1, the present invention teaches providing a protective coating on metal conducting surfaces formed on a bare board in the manufacture of printed circuit boards. Additionally, amended claim 1 of the present invention

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recites that the protective coating is provided on metal surface elements by contacting the metal surface elements with an aqueous displacement plating composition which exists in an aqueous vehicle, as opposed to ammonia as recited by Greenberg. As recited in the specification of the present application, the use of ammonia is disadvantageous because ammonia containing silver solutions are unstable and may be explosive as a result of azides which tend to form therein.

Since Greenberg teaches applying a solution to a non-metallic glass surface by an electroless deposition, Greenberg clearly teaches away from the invention taught in amended claim 1 of the present invention. Furthermore, unlike the method of Greenberg where copper is exposed on the substrate and which oxidizes thereon, the present invention is directed to eliminating the oxidation of copper by ensuring properly adhered solder joints on metals.

Since Greenberg is not directed to improvements in printed circuit board manufacture and since Greenberg teaches away from the present invention as recited in amended claim 1, there can be no motivation or suggestion to combine it with Donley to teach the present invention. Nevertheless, unlike the present invention which teaches providing the protective coating by a displacement plating process, Donley teaches a method for electroless plating on a porous metal surface. As recited in the specification of the present application, the reaction in an electroless plating composition is effected by a catalyst. In contrast, a displacement plating or electroplating process as taught by the present invention is caused by the passage of electric current through the electrolytic solution. In light of this, both Greenberg and Donley teach away from the present invention.

Furthermore, the process of amended claim 1 recites that the protective coating which is provided on the metal surface elements comprises contacting the metal surface elements with an aqueous displacement plating composition which comprises silver ions and a multidentate

complexing agent in solution in an aqueous vehicle at a pH of from 2 to 12. The Examiner recites in the Office Action that the pH of a plating composition is a well known “resultant effective” variable which can be optimized through routine experimentation by one skilled in the art. The Action notes that it has been well settled that the “optimization” of a well known “resultive effective” variable is deemed as a modification of the prior art without the showing of unexpected results. Applicant respectfully disagrees. The Examiner has shown no suggestion or teaching in a prior art reference with regard to why the pH is a well known resultive effective variable obvious to one skilled in the art.

Accordingly, there is no motivation or suggestion to combine the teachings of Greenberg with Donley to arrive at the present invention. Nor does the combination of Greenberg with Donley teach or suggest the invention as recited in amended claim 1. Accordingly withdrawal of the rejection on these grounds is respectfully requested.

As claims 3-9 and 11-17 depend directly or indirectly from amended claim 1, the rejection to these claims under 35 U.S.C. §103 should be withdrawn as well.

B. Claim 10 stands rejected under 35 U.S.C. §103(a) as obvious over Greenberg et al. (USPN 3,993,845) in view of Donley et al (4,171,393). The arguments above with regard to amended claim 1 are incorporated here. Accordingly, since amended claim 1 is not obvious under 35 U.S.C. §103 and claim 10 depends directly from claim 1, the rejection to this claim should be withdrawn as well.

C. Claims 2 and 18 stand rejected under 35 U.S.C. §103(a) as obvious over Greenberg et al. (USPN 3,993,845) in view of Donley et al (4,171,393) and further in view of Applicant's

admitted state of the art. Applicant respectfully traverses this rejection for the reasons set forth below.

The Office Action recites that “it would have been obvious for one skilled in the art at the time the invention was made to have utilized Greenberg in view of Donley silver replacement process for depositing silver on copper in Applicant’s admitted state of the art printed circuit board construction because one skilled in the art would want to obtain the benefits associated with such a process...”

With regard to claim 2, the arguments made above with regard to amended claim 1 are incorporated here. Accordingly, since amended claim 1 is not obvious under 35 U.S.C. §103 and since claim 2 depends directly from claim 1, the rejection to this claim should be withdrawn as well.

As previously discussed with regard to the rejection to claim 1 under 35 U.S.C. §103(a) in section A. above, the prior art references teach only electroless plating. Since both Greenberg and Donley, either alone or combined, teach away from the present invention, claim 18 is not rendered obvious under 35 U.S.C. §103(a). As explained in greater detail above, the instant invention is directed to a process improvement in printed circuit board manufacture which uses electroplating, or more specifically, aqueous displacement plating which is a process is caused by the passage of electric current through the electrolytic solution, as opposed to a catalytic process (electroless plating). Additionally, Greenberg teaches that copper film oxidizes on a non-metallic (glass) substrate and that an ammonia silver salt solution with a complexing agent is then applied over the copper layer on the non-metallic substrate. The use of ammonia teaches away from the present invention, which recites an aqueous displacement plating composition in

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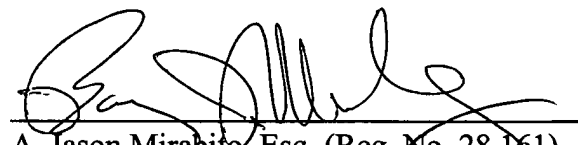
an aqueous vehicle. Accordingly, neither Greenberg nor Donley, alone or combined, teach the process are recited in claim 18.

Since the references teach away from the instant invention, so there is no suggestion or motivation to combine Greenberg and Donley and claim 18 is thus not obvious under 35 U.S.C. §103. Accordingly, the rejection thereto should be withdrawn.

III. CONCLUSION

Based on the foregoing, the application is believed to be in condition for allowance, and a notice to that effect is respectfully requested. However, if the Examiner should have any questions or would like to discuss the present invention, he is invited to telephone the Applicant's attorney at the telephone number provided below.

Respectfully submitted,



A. Jason Mirabite, Esq. (Reg. No. 28,161)
Barry J. Marenberg, Esq. (Reg. No. 40,715)
Mintz, Levin, Cohn, Ferris
Glovsky and Popeo, P.C.
One Financial Center
Boston, MA 02111
Telephone 617/348-1805
Attorneys for Applicant

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